

# AMSAT

## SATELLITE REPORT



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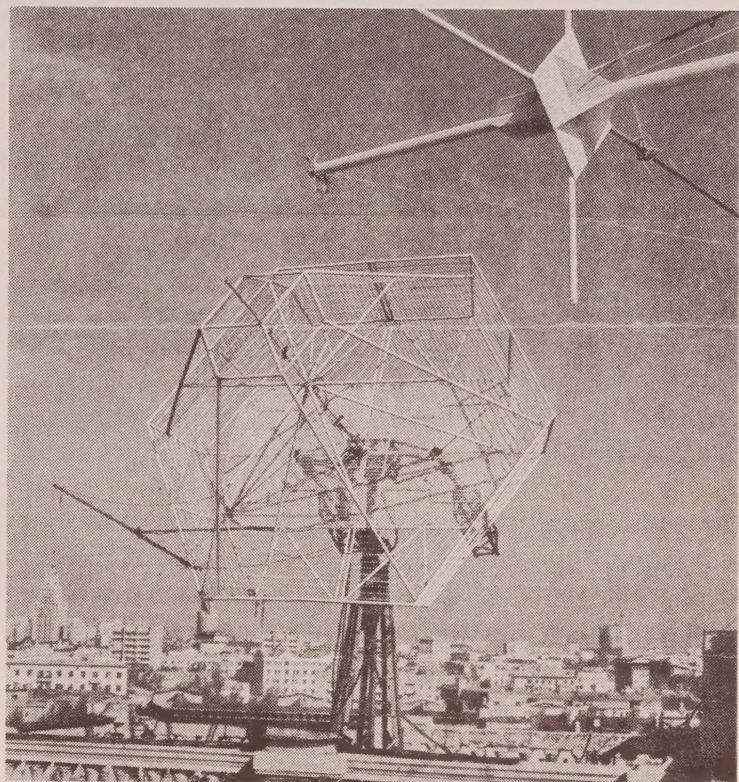
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### Magazine Yields Clues To RS Design

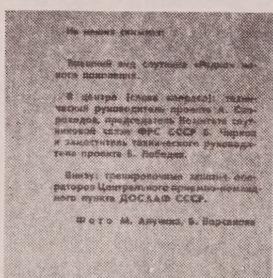
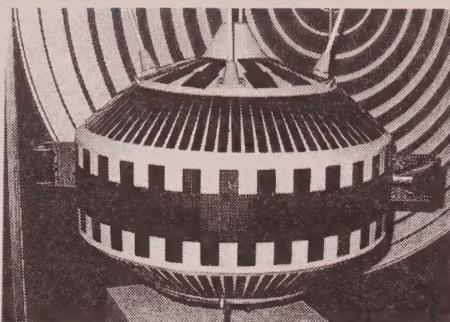
The January issue of the Russian amateur radio magazine *RADIO* provides some tantalizing clues to the nature of the new satellites called *RADIO* 3 through 8. The cover, cover story and photo captions translated by Dex Anderson, W4KM, reveal new aspects of the birds not announced previously and suggest further possibilities.

The cover photo shows the central command and control center at the DOSAAF/USSR facility in Moscow. The array is apparently installed on the roof of an office building in or near city center. The antenna structure is an ungainly arrangement unlike anything we have seen. The best guess is that the az-el mount originally supported a parabolic dish in the 20 foot class and that it now has been converted for use with yagi-type antennas. At the center of the structure in the midst of an unbelievable mass of tubular struts is a 2 meter crossed yagi having perhaps 7 or 8 elements in each plane. The type of feed used is not apparent. A very large reflector screen is apparently employed. The use of circular polarization on the new *RADIO*s is not a surprise. Several observers have reported an apparent preference for RHCP on the *RADIO* uplinks. Also in the photo is what quite plainly is a 70 cm linearly polarized yagi of about 14 elements. One is left to ask what this is doing here. There would seem to be at least three possibilities. 1. Use with Mode B and or J. 2. A 70 cm command link for the *RADIO*s. 3. An unannounced 70 cm transponder input or output on the *RADIO*s. Perhaps it is some combination of all three.

On cover two are three photos. Two of the photos are of individuals connected with the program from both the official side and the user side. The official side is shown in the person of the Chairman of the Federation of Radiosport. Presumably subordinate to him is a member of the Satellite Coordination Committee. Finally there is shown the deputy technical project leader, Boris Lebedev, UA3ADI, who one might surmise is the Gordon Hardman, KE3O/ZS1FE, or Ulrich Mueller, DK4VW, of DOSAAF. The third photo on this page is quite revealing. It shows what is apparently one of the new satellites in a public display context. We can learn several things from the photo. First, the satellite appears much larger than one might expect. One might guess the roughly cylindrical cross section has a diameter of one meter or so (About 40"). Approximately 80% of the surface is



covered with solar cells giving the impression of a powerful device able to support the several devices aboard quite easily. The antenna structures are easily located. Diametrically opposed on the sides of the cylinder are two ten meter antenna deployment mechanisms. These appear to dispense a metallic tape about 10 cm wide. From the color of the tape and the apparent torsion it would appear that the tape is made of spring copper (beryllium alloy copper) or copper plated steel. At the top of the spacecraft are a series of rods which, because of the way the picture is cropped, are more difficult to interpret. It is likely, however, that the four rods seen from a canted turnstile for 2 meters with each rod angled about 30 degrees to the main axis of the spacecraft. (This would seem to confirm the notion of circular polarization which is in turn supported by a system block diagram showing two uplink antennas feeding a combiner/shifter.) Finally, on close inspection there appears to be still another antenna atop the spacecraft. Again, because of photo-cropping it is most



difficult to determine if this is an antenna and if so what is its length. Judging by its diameter, one could guess it to be quite short. Its diameter appears to be about one third that of the 2 meter turnstile elements. Could this be a 70 cm monopole? If so, what do you suppose it's used for? Maybe we'll have some answers to these questions later this Spring!

In the cover story itself we learn a few interesting new facts. We learn from a review of the history of the Radio Sputniks that the first RSs (1 and 2) resulted from the idea of a group from *RADIO* magazine in 1975. Control stations were established at the DOSAAF/USSR Space Technology Laboratory and the Moscow Aviation Institute. RS-1 and RS-2 used unpressurized components. (It is likely that one or more of the new birds IS sealed and pressurized since it has been learned that telemetry channel U in the first group reports a gas pressure.) It is proudly reported that with RS-1 G3IOR was able to work the command station in Moscow (RS-3A?) with only 30 to 50 mW. The results of the RS-1 and RS-2 experiments led directly to this new class of satellites called RS-3 through 8. It is significant that the article uses the terms "a continuously operating system of...satellites" to describe the new birds. This seems to confirm the intent that when sufficiently dispersed, they should provide "continuous" coverage (whatever that means!).

The article goes on to rate the capacity of each new *RADIO* Sputnik at "20 duplex telephone channels" (at 2.5 kHz each that's reasonable) or "80 telegraph channels" (that's 625 Hz each; generous). Extensive use of integrated circuits is reported. The robot is prominently placed in the article and thoroughly explained. A 100 character circular announcement feature or bulletin

board is explained. The article explains the overall operation of the transponder including the robot, command decoder and transponder proper. The command repertoire is at least 56 commands and there is apparently some on-board autonomy in the event the spacecraft gets into trouble while out of range of the command station. This is apparent in the use of phrases like "a broad program" referring to the on-board command complex. There is a possibility that parameters such as temperature and pressure can be adjusted under ground command though the article does not state this explicitly. The power system consists of chemical batteries and solar cells. The control of the telemetry output is highly flexible and completely under ground control allowing the telemetry to be specifically tailored for routine scientific purposes as well as for spacecraft contingencies. For example, to learn the spin rate and orientation, the article suggests that the solar cell array current could be continuously monitored. Finally, the article closes with the assurance that the new birds are "destined for a longer period of operation than were the first educational satellites of 1978."

One wonders if the authors were referring to AMSAT OSCAR 8 which continues to work flawlessly or to the RS-1/2 duet which fell from grace after but a few months of operation. In reviewing this article for *ASR* one is struck at once by the fact that only once is OSCAR mentioned. In explaining how wonderful were RS-1/2, it is noted that the "RADIO satellites were" more efficient "than those of the analogous satellites of the OSCAR series." In fact, reading this article alone one would get the impression that nothing at all has been done in the field of amateur satellites outside of the Soviet Union. What a pity!

## Sun Flower Blossoms At S-Band

The meteorological satellite launched by Japan last autumn on a rocket designed and built locally (see letters column, *ORBIT* #9) has been a notable success and great source of pride. GMS-2 was launched from Japan 10 Aug. 81. The nickname for GMS-2 is *Himawari* 2 which means Sun Flower. JA2WO writes to *ASR* that the frequencies on which Sun Flower may be heard are 1687.0 and 1691.0 MHz. The 10 watt downlinks occupy 1 MHz and 260 kHz bandwidth for the high and low resolution imagery, respectively. The geosynchronous satellites are positioned to serve Asia. Further details may be obtained from JA2WO for an SASE.

In a nation whose economy is among the strongest and whose technological base is in many areas on a par with any, the success of its home-grown space program is a great source of prestige and pride for the Japanese. Just as the European Space Agency reflects not only the emerging sophistication of Europe's indigenous space program but its great satisfaction in wresting some of NASA's bread and butter launches away from the Shuttle, Japan's newly demonstrated space program may also bode of things to come.

## ASR Spotlight On: WD4FAB

Dick Jansson, WD4FAB, became a ham in 1972 (WA1QLI) primarily to advance his interests in radio controlled model airplanes. Little did he know then that he would be playing a critical role in the design and construction of an amateur craft destined for much higher flight!

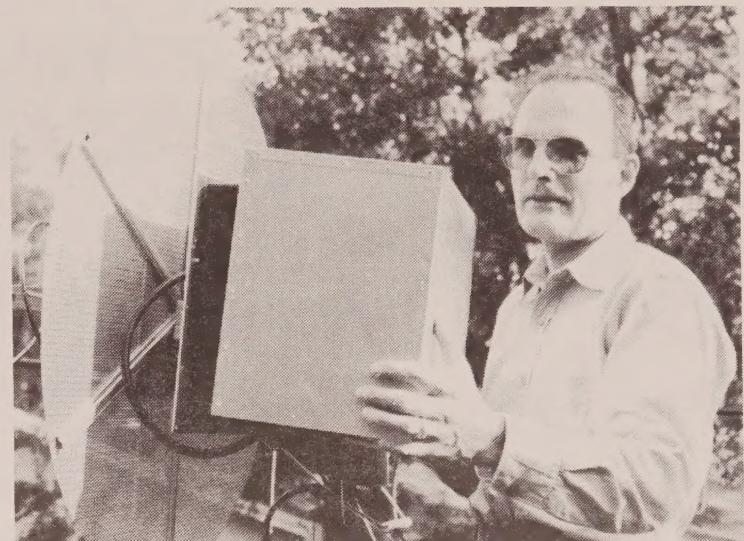
Dick is not a stranger to spacecraft, though. He's worked with them professionally for over two decades. As a mechanical engineer with a major aerospace concern in Florida, Dick has been doing thermal design on spacecraft since the very early Apollo days. He also worked on the Titan II rocket and is an expert cryogenecist. With all this talent and relevant experience it is astounding to note that AMSAT almost let him escape.

It was in the closing phases of the design of AO-8 that one of AMSAT's alert functionaries Bill Hook, W3GBC, responding to a call for help from W3GEY, recalled having seen Dick's AMSAT application with notes indicating experience as a thermal designer. The rest, as they say, is history. Dick got in touch with W3GEY and some loose ends in the design of AO-8 were tied up.

Dick had his first contact through AO-7 in August of 77 and was thoroughly captivated by the experience. Since then he has been active on the birds as much as his busy schedule allows. Besides his work for AMSAT he is also a VHF/UHF advisor to the ARRL and frequency coordinator to the AMA (Academy of Model Aeronautics). He also writes articles. Dick has had two articles published in AMSAT's journal, *ORBIT*. Both had to do with antennas for use with the OSCAR satellites. They appeared in *ORBIT* #1 and #7.

Dick is active in RTTY and especially interested in 2 and 6 meter operation. He is most proud of his 6 meter WAS. He is still occasionally jabbed by friends who recall aloud Dick's 6 meter amplifier cooler. It contained, in consonance with his professional skills, a freon heat exchanger replete with plumbing and convection circulation system! His next major project for the home station is reputed to be an antenna for the 1269 MHz uplink of Phase IIIB.

The Phase IIIB project will evidence much of Dick's handiwork when it's complete. Dick did a comprehensive thermal model of Phase IIIA on his company's computer system and developed a thermal blanket system to provide the desired thermal characteristics for the spacecraft. The model was constructed within the framework of a computer program called SINDA. Through its use, the designer can gain invaluable insight into the thermal performance of a spacecraft in the difficult environment of space and all of the variables the spacecraft will encounter in its life. Moreover, Dick personally designed and built the fiberglass stringers which not only serve to isolate the Phase III modules thermally but also provide needed rigidity for the flight structure itself. These were built at home and cured (typically) in his oven. Further calling on his expertise, the Phase IIIB spacecraft has required a substantial amount of



WD4FAB secures the cover of the equipment enclosure on his 70 cm Helix.

engineering in the area of the plumbing associated with the new liquid fuel kick motor. Dick has stepped in to consult on this facet as well.

As time allows, Dick spends time working on a project that has been on his mind for some time: a solid state KW for HF. He'll probably have it water cooled if we know him! WD4FAB is often heard on the AMSAT Nets. Together with W4MID he helped start the SEASAT (South East AMSAT Satellite Net) which meets on Sunday mornings on 40 meters (7280 kHz at 1300 UTC). The net control is now WB4ZXS.

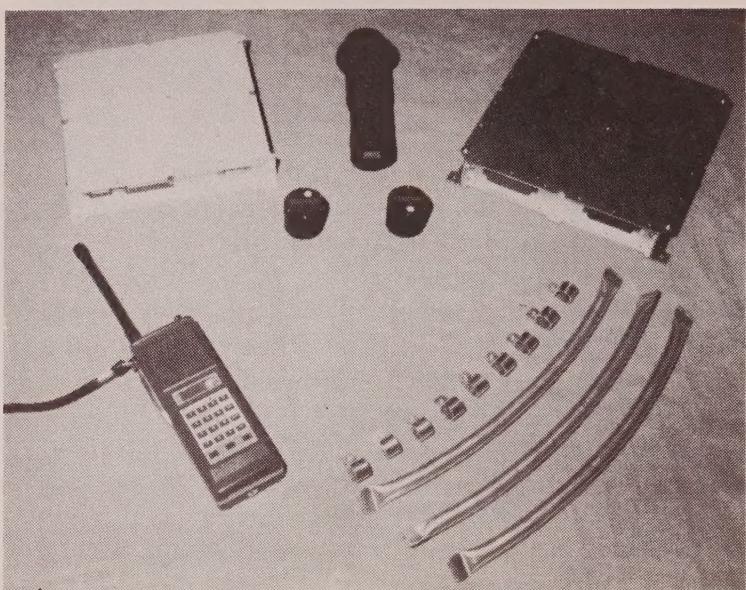
How fortunate are we to have the likes of WD4FAB around to help AMSAT when to do without the talents provided by dedicated individuals such as our subject is virtually unthinkable! Dick's enthusiasm for helping to build amateur spacecraft is amazing and his skill is respected universally. Every ham who uses AO-8 and who will ever use Phase IIIB (to become AMSAT-OSCAR 10 after launch) personally owes Dick a debt of thanks for his superb contributions. Without WD4FAB on the team, the life expectancy of Phase IIIB would not be at all the same. Thanks, Dick! ASR and all of AMSAT salutes you and encourages you to persist in your excellent work!

## Robot Use Gets Nod

Use of the robots on Radio 5 and 7 as single channel repeaters when they are not calling CQ has been OKed according to G3IOR who has been in contact with the authorities in the USSR. The informal advice was passed to western stations on the weekend of 20-21 Feb.

## New Project OSCAR Calendars

Project OSCAR will be bringing out a new version of its famous amateur satellite orbit prediction calendar soon. The new version will be the largest ever and provide orbit details on AO-8 as well as all the new RS birds (3-8). According to Project OSCAR officials the new calendar will be available shortly. Monitor ASR and the AMSAT Nets for announcements regarding price and availability of the calendar.



Phase IIIB equipment which arrived from Germany recently. Clockwise from lower right: Nutation dampers and clamps; HT (for scaling other objects); Battery charge regulator (from Hungary); Earth and sun sensors (large one is earth sensor); Sensor electronics unit.

## Mystery Abates in 13 cm Satellite Case

The identity of the 230 MHz satellite emissions was all but certain when ASR learned last week additional particulars concerning the object. ASR #26, page 2, detailed what was known through early January, 1982. Now it turns out that the answer was in our grasp all along had we just known where to look.

A confidential domestic source turned our attention to ORBIT Magazine #5 for Jan./Feb. 81. There on page 27 in Geoffrey Falworth's column was found the identity. From the Falworth column: "COSMOS 1217 (1980-85A) launched on 1980 Oct 24; initial orbit 718.09 min, 62°.92, 39767 km, 606 km; transmissions 2292 MHz. Early warning satellite."

It was not explained why emissions had been detected by European EME experts at precisely 2304 MHz or 12 MHz higher than the known emissions of COSMOS 1217. AMSAT officials relayed news of the ID of the intruder to ARRL for possible action with the intruder watch. Bob Atkins, KA1GT, whose "World Above 1 Gig" column in QST reported the interloper in the January issue was also apprised of the "make" of the COSMOS. The FCC also expressed an interest when contacted on an informal basis recently.

It is not clear at this time whether the COSMOS is designed to work at 2304 MHz or if a technical malfunction has occurred. According to ITU allocations, 2304 is for radiolocation (primary) with Amateur (secondary). However, the interpretation of "radiolocation" varies almost at the will of the interpreter and one is left to wonder if "early warning" has been construed as "radiolocation." Early warning satellites employed by the two super powers employ a battery of sensors to detect an attack at the very early stages. Typical are in-

frared sensors to see the plumes of heat resulting from ICBM launches, radar, ultra violet detectors, gamma ray detectors et al.

Correlation of the 13 cm emitter with COSMOS 1217 was submitted by a U.S. source who preferred to remain nameless. We thank him nevertheless!

The identification of the 13 cm source removes one possible explanation as to what may be the nature of a "surprise" planned by the DOSAAF folks for RS-3 and 4 this Spring. As reported in ASR #27, there have been hints of things to come from Moscow. It had been surmised that the 13 cm emissions might have some connection. Other possibilities remain. For example, there have been a few reports of signals at 433.1 MHz that, it is reported, have some connection with the new Radio birds. A story elsewhere in this ASR offers some insight on this aspect.

## New Editors Further Bolster Staff

ORBIT Magazine Editor-in-Chief WA2LQQ announced recently a further addition to the staff of AMSAT's bi-monthly journal. Chairman of the Board of Directors W6SP, John Browning, will begin a regular column in ORBIT with issue number 10 (now in production). According to W6SP, he will endeavor to write on some of the aspects of the Amateur Space Program as it affects Amateur Radio in general and to offer some guiding philosophy for the members and program planners. W6SP believes that it is important for the organization as a whole to have a firm grasp on objectives and to know how we collectively plan to reach those objectives. At press time W6SP was evaluating various candidate names for his regular column.

The addition of W6SP to the masthead of ORBIT continues a building process begun at year's end when it became evident to many that the existing ORBIT organizational structure was inadequate for the tasks imposed on it. K1FM, Tony Dorbuck, an experienced Editor with nearly ten years at ARRL, was hired as part of the restaffing/reorganization process. Other changes can be expected as requirements dictate, according to WA2LQQ.

On a parallel note, ASR is delighted to announce the appointment of N6TE, Dr. Harry Bluestein of La Jolla, California, as ASR Contributing Editor. At the outset Harry's beat will include computer products (H/W & S/W) as they relate to amateur satellites. Look for Harry's byline in future ASRs. Harry is a Medical Doctor and teaching Professor at the University of California, San Diego.